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16 May 1980

USSR Report

TRANSPORTATION

No. 8

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AIRCRAFT DESIGNER DESCRIBES IL-86

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 1, 1980 pp 14-19

[Article by G. V. Novozhilov, general designer and Hero of Socialist Labor: "Familiarize Yourselves with the Il-86"]

[Text] The increased volume of passenger transport and the growing saturation of the airspace, especially in the vicinity of airports of the country's large administrative, industrial and resort centers, have dictated the need to build a wide-bodied aircraft with large passenger capacity. Such an aircraft--the first Soviet airbus, the Il-86--has been developed at the Experimental Design Bureau imeni S. V. Il'yushin.

The overall increase in passenger flow and its distribution on specific air routes, depending on their distance, were considered to be the technical requirements which formed the basis for planning the aircraft. These requirements had a significant influence on the configuration and design features of the airbus and determined its basic technical performance. Based on actual operating conditions, an aircraft of this type should be designed to transport a large number of passengers, their baggage and cargo on the main medium-range air routes. For this reason, the following basic data were specified: number of passengers 350, maximum payload 42 tons, operational range 3,600 kilometers with a 40-ton payload and 5,800 kilometers with a 20-ton payload. The cruising speed at altitudes of 9,500-10,000 meters is 850-950 km per hour, and the maximum Mach number determined in operation is 0.88. The new aircraft should be operated at airports having a runway 2,600 meters long and 45 meters wide.

/Basic Features of the Aircraft/ [in boldface]

Selection of the airbus layout was preceded by detailed analysis of possible configuration variations: high-wing and low-wing, wings of varied sweepback, with three and four engines of varying degrees of bypass (from 1.3 to 5.2). Single-deck and double-deck layouts for passenger accommodations were considered, and efficient combination of the basic parameters which would provide the required performance was determined. Research indicated that, from the viewpoint of economy, flight safety and

convenience in operation, the most advantageous configuration is a low-wing aircraft with engines attached to pylons beneath the wing.

The question may arise: why did we switch to installation of the engines under the wing in preparing the low-wing design, when they are mounted on the tail end of the fuselage on the Il-62 aircraft, which has proved itself well? Such an alternative also was considered, in fact; two designs of the aircraft were made with both engine arrangements, comparative computations were made, and aerodynamic performance was assessed with wind tunnel tests of models. As a result, the advantages of the tail mounting of engines on the Il-62 were fully reconfirmed. But the Il-86 has a number of key distinctions. Thus, basing the aircraft at airports with narrow runways requires that the opportunity to turn on a runway only 45 meters wide be assured. When engines are mounted on the tail end of the fuselage, performing this requirement is extremely difficult because of the need to increase the wheelbase between the nose gear and main landing gear struts by approximately 6 meters. When the engines are mounted under the wing it is simpler to provide a broad range of operating center-of-gravity positions--up to 20 percent, which is particularly important in using the baggage- and cargo-handling system which is being used for the first time on the Il-86. And finally, there also are operating advantages--simplicity of servicing engines, their ease of detachment, and so forth.

The configuration finally adopted for mounting the engines is not new for our bureau. As far back as 1957, under the leadership of S. V. Il'yushin, the experimental Il-22 jet aircraft was developed with this design, and later we used it on the Il-76. For this reason, we can say that the aerodynamic design of the Il-86 was chosen on the basis of our many years of design experience.

Operating the Il-86 at airfields with thin concrete pavement required installation of a third strut under the fuselage for the main landing gear. Although this decision also was connected with increasing the weight of the aircraft, it provided the opportunity to use airfields designed to accommodate Il-18, Tu-134 and Tu-154 aircraft for the airbus without reconstruction.

Selection of the engines is one of the most complex problems in developing a new passenger aircraft. The various qualities of an engine are taken into consideration, but in all cases they must be as reliable and safe in operation as possible. Precisely this condition proved to be decisive, determining the selection of the NK-86 engines, with modified values of the basic parameters for the Il-86: the degrees of bypass, the rates of increasing pressure in the compressor, and the temperature of gases in front of the turbine.

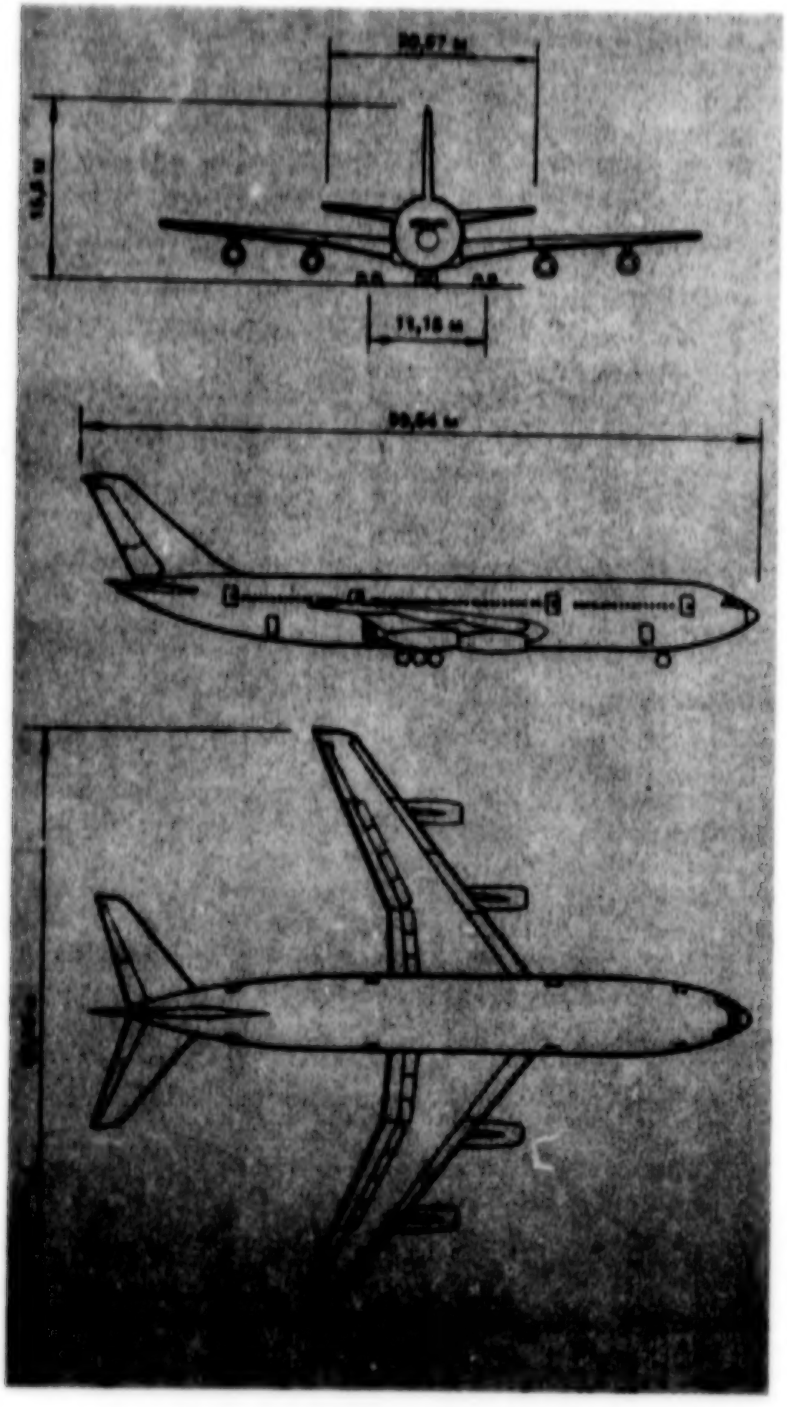

PHOTO CAPTION

Dimensions of the Il-86 airbus aircraft.

The tasks of determining the optimum diameter of the fuselage and selecting the variation for accommodating passengers, baggage and cargo were rather complicated. The effort to simplify the procedure for serving passengers at airports, especially by reducing baggage-handling operations, was predominant. This would make it possible to increase the labor productivity of ground service workers and the true speed of the trip for the passengers. In the final analysis, a number of new design solutions, in our opinion, provide the opportunity to increase the economic efficiency of operation of the Il-86 aircraft. The advisability of simplifying the baggage-handling system is corroborated by questionnaire data, which indicate that nearly all passengers would like to carry baggage weighing 10 to 15 kilograms with them. Inspection in 7,000 cases showed that when the flight is up to about 4,000 kilometers, 90 percent of the passengers carry goods of precisely such a weight.

Our approach to solution of the problem is based on a principle which may be expressed by the formula "carry-on baggage plus containers." In working out this system based on analysis performed by the State Scientific Research Institute for Civil Aviation, the average parameters of the baggage taken as the basis for developing the aircraft's configuration were obtained.

In comparing the different alternatives for accommodating baggage, one of the first arrangements analyzed was storage next to the seat or on a baggage rack. In this case, however, even with a double-deck layout of passenger cabins, the length of the fuselage is increased by more than 3 meters compared with separate accommodations. Baggage in the passenger cabin also requires the equipment of special slots. A separated system for accommodating passengers and baggage on the upper and lower decks makes it possible to resolve the problem of setting up a system of "carry-on baggage," which ensures operational flexibility in the use of the aircraft.

A fuselage with a diameter of 6.08 meters was chosen for the Il-86 aircraft. Because of this, the basic characteristic of its interior is the large amount of space and the unusual dimensions of the passenger accomodations. The feeling of spaciousness is emphasized by the straightened sides and high ceiling of the cabin, as well as by two wide aisles between the seats, the use of new forms of decorative finishing, and the substitution of baggage racks with convenient little cabinets for hand luggage. Closely positioned windows with inside measurements of 380 by 250 millimeters--the largest, compared with other similar aircraft--let in a great deal of light, emphasizing the large area of the passenger cabins. The window installation provides for convenient positioning of seats in any configuration.

The passenger seats are being installed in three cabins separated from each other by buffet counters and upholstered collapsible partitions. The basic version provides for installation of nine seats in a row in a 3-3-3 arrangement. The seats along the sides have been shifted slightly out of line with the seats in the center row, which ensures the unobstructed simultaneous exit of passengers from both rows into the aisles. The availability of two aisles, in turn, speeds up the seating of passengers and reduces the time spent by flight attendants in serving food as well. Compared with the fuselages of other wide-bodied aircraft, the aisles also are the widest (550 millimeters).

Still another feature of the Il-86 layout is the use of integral ramps which significantly extend the operational capabilities of the aircraft. By means of three ramps along the left side, passengers reach vestibules on the lower deck which have been equipped with shelving compartmented for suitcases and other personal belongings. In addition, two cargo bays adapted for mechanized loading and unloading of eight standardized baggage and cargo containers or cargo pallets are situated on the lower deck. A galley and compartments for technical equipment also are located on the lower deck.

After stowing their baggage, the passengers climb to the upper deck by an interior stairway and take their seats in the three passenger cabins. Upon arrival at their destination, the passengers leave the aircraft without delay after taking their baggage. With heavy or large-size baggage they can avail themselves of the services of the container service and turn in and receive their baggage by the usual means. Such a procedure, in our view, will most fully respond to the heavy "airbus" traffic.

The system of "carry-on baggage plus containers" and the integral gangways make it possible to take advantage of the Il-86 aircraft under the most diverse conditions at any airports.

True, it should be noted that nothing is usually obtained without cost in aviation: obtaining the advantages connected with use of the "carry-on baggage plus containers" system and integral gangways required an increase in the fuselage length of about 3 meters, compared with the purely "container" version of the aircraft. Together with the additional landing gear strut under the fuselage, this resulted in an increase in weight of 4,200 kilograms.

Dismantling the design elements of the system of interior stairs, access trapdoors in the floor of the passenger cabin and the integral gangways will make it possible to increase (if necessary) the number of passengers by 25 and the weight of the maximum payload by 3,000 kilograms. By this means, in the purely "container" version, the Il-86 will take on board up to 375 passengers (by installing seats measuring 810 millimeters) and 20 standardized baggage and cargo containers. In this case, the production cost of transport is reduced by 7 percent.

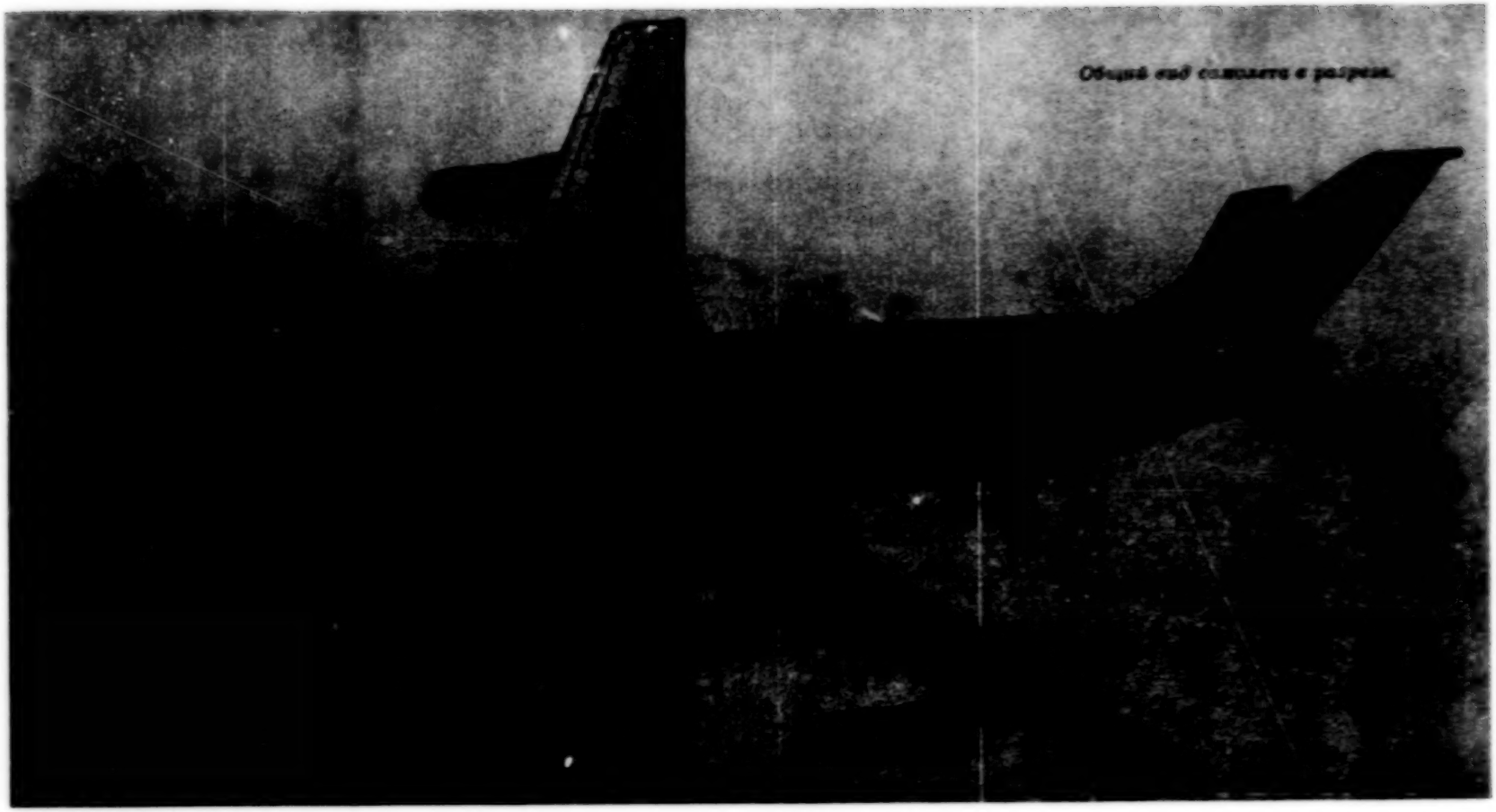

PHOTO CAPTION

Overall cutaway view of the aircraft.

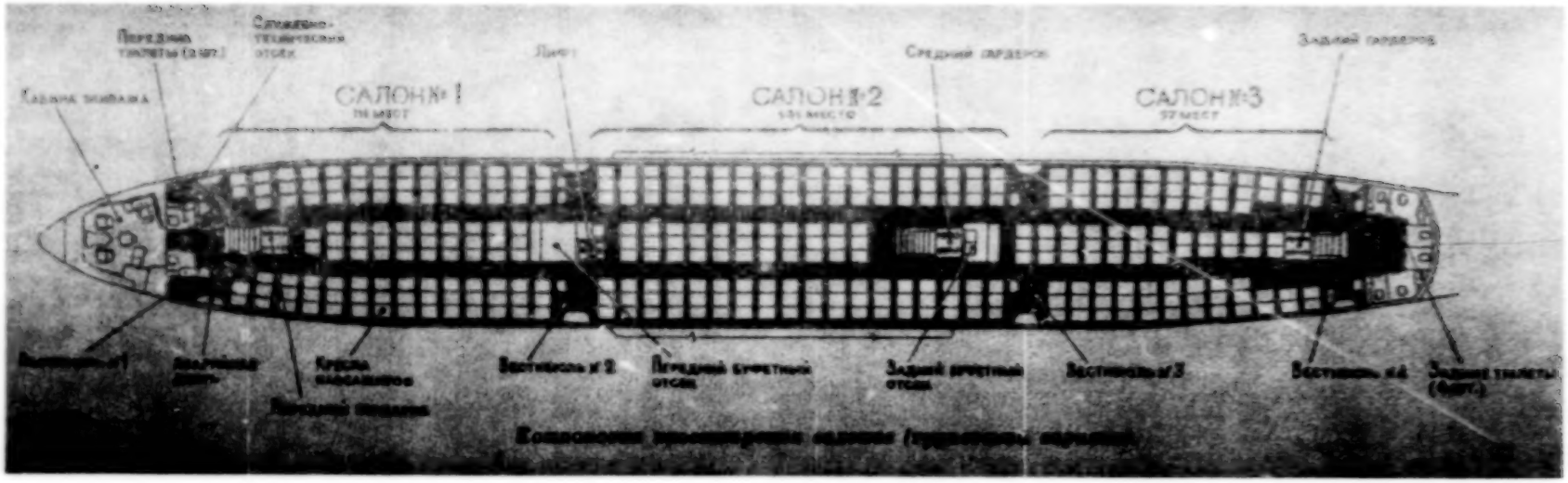

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PHOTO CAPTION

Arrangement of passenger cabins (tourist version).

KEY: (Clockwise, beginning at top left of diagram)

1. Cockpit
2. Forward restroom (2 positions)
3. Fmployees' technical compartment
4. CABIN No 1, 111 seats
5. Elevator
6. CABIN No 2, 141 seats
7. Central coat closet
8. CABIN No 3, 97 seats
9. Aft coat closet
10. Aft restroom (6 positions)
11. Vestibule No 4
12. Vestibule No 3
13. Aft buffet compartment
14. Forward buffet compartment
15. Vestibule No 2
16. Passenger seats
17. Forward coat closet
18. Emergency door
19. Vestibule No 1

/Airframe and Systems of the Aircraft/ [In boldface]

All systems of the Il-86 were planned on the basis of multiple redundancy and the backup of vitally important units and gear which ensure trouble-free operation of the aircraft when there are any types of failure in individual elements.

The principle of "safety in a breakdown" forms the basis for the airframe design. It has been developed by taking into account the provision of a long operating life. The aircraft's framework is basically riveted with aluminum alloys. Molded panels and large-size stamped components have been widely used. Many of them were made from high-strength aluminum alloys, titanium, and special steels.

Much that is new was utilized in the airframe construction: adhesive-riveted panels, honeycomb structures, various forms of titanium fastening, new types of rivets, different forms of reinforcing structural elements, and much else.

All this required the development and introduction into series production of new manufacturing processes. In all, more than 50 new processing methods were used in building the Il-86 aircraft.

The panels of the floor of the passenger cabin and the cargo deck were made out of composition material--honeycomb and carbon plastics [ugleplastik]. Interior finishing of the passenger cabin is made out of aluminum sheet [alyumoplast] and nonmetallic honeycomb structures. Non-flammable materials with a pleasing range of colors have been used here.

One of the basic systems of the aircraft is the powerplant installation. It consists of four NK-86 turbofan engines with a combination of the flows of the exterior and interior ducts in a common exhaust unit, as well as systems and equipment which safeguard operation of the engines.

The NK-86 engine has a relatively low bypass--1.3--performed through a twin-shaft arrangement with the combined flows of the exterior and interior ducts. The takeoff thrust, equivalent to 13 tons, is maintained constant with ambient air temperatures of up to plus 30 degrees. A characteristic of this engine, built under the leadership of General Designer N. D. Kuznetsov, is its high reliability, long operating life and minimum technical maintenance. As experience in operating the Il-62 shows, the number of ahead-of-schedule removals of this type of engine per 1,000 hours of operation is less per sequence than engines with high bypass and high turbine inlet temperature.

The engine has an axial-flow two-spool compressor. There is a stator in the front part of the low-pressure compressor, and a variable stator with rotating blades has been installed in the front part of the high-pressure compressor. The engine has a multiple-injector combustion chamber, of

the annular type. The turbine is two-stage; the first stage turns the high-pressure compressor and the second stage turns the low-pressure compressor. An exhaust unit consisting of a cascade thrust reverser with deflector doors and a noise suppressor has been installed in the rear section of the engine. Noise suppression is ensured by the special construction of the casing, with wide use of special honeycombs as well as with the aid of an extension-type ejector and jet stream dispersers.

Operation of the engines is ensured by a fuel system with filter preheaters, which will make it possible to avoid using I-1 liquid; fire-extinguishing and deicing systems with automatic and manual control; self-contained (in each engine) lubrication systems; an automatic in-flight starting system; an automatic electronic control system; and other gear.

The crew is informed of powerplant performance by indicators and light warnings.

The engines and nacelles are easily removable. Replacement of an engine is performed under airport conditions with the aid of accessories which form part of the set of ground-based equipment.

Hydraulics are used to operate the rudders, ailerons, stabilizer, spoilers, deceleration flaps, slats and flaps; for extending and retracting landing gear; for braking and turning the wheels; for putting the windshield wipers in operation; and for opening and closing the access doors with integral gangways. With the aim of ensuring high reliability, four hydraulic systems which are fully independent of each other and do not have common hardware, piping or servo mechanisms have been installed on the aircraft. Pressure in the hydraulic systems is provided by two piston pumps in each engine. A turbopump unit is turned on when engines are not in operation.

The aircraft is controlled in flight manually or automatically. An automatic flight control system ensures flight on a course or on a landing approach. With manual control, an automatic stability and controllability system, consisting of roll and yaw dampers, is turned on. This facilitates piloting to a significant extent and reduces pilot fatigue.

Irreversible hydraulic steering drives (servos) function as actuating power units, deflecting rudders, ailerons and spoilers. The system is irreversible, and the transition to control without servos was not incorporated.

Control of the stabilizer, flaps, slats and deceleration flaps is electrohydraulic.

The control surfaces, aside from the ailerons and stabilizer, have been separated in stages, each of which is deflected by one or several steering drives. The redundancy of drives improves operational reliability.

The controls have been connected with steering drives by a mechanical cable system /mekhanicheskaya provodka/. Duplicate cable systems are conveyed along the sides.

A three-phase alternating-current circuit of 200/115 volts and a frequency of 400 herts serves as the basic primary power supply system. It consists of four independent channels. The source of electric power for each channel is a generator rated at 40 kilowatt-amperes.

Secondary sources--a three-phase 36-volt alternating-current system and a 27-volt direct-current system--have been connected to the primary circuit. Standby power supply sources also have been included: an alternating-current generator for the emergency powerplant, five storage batteries and a single-phase alternating-current static converter.

The power supply system provides power for all users even when generators fail (just two generators are sufficient for normal operation).

The navigation and piloting equipment permits flights with a crew of three on domestic and international routes under any climatic and geographical conditions, in any season and time of day. It includes three complexes: airspeed parameters, piloting equipment, and basic navigation. The airspeed parameters complex provides the crew and systems of the aircraft with current data on pressure and true altitudes, indicated and true airspeeds, the Mach number, and the outside air temperature; warns of dangerous speed near the ground during landing and takeoff, of reaching the airspeed and Mach limits, and of leaving the assigned flight level; and provides the controlling signals used for automatic control.

The piloting equipment complex is intended for manual, semiautomatic (directional) and automatic control in all stages of flight.

A navigation computer is part of the basic navigation complex. It is designed to program the route of flight and plan the landing approach, reckon the aircraft's coordinates, correct its course, display data on current navigational parameters, produce signals for automatic control in the horizontal plane, and so forth. In addition, the complex has systems for azimuth and elevation, close navigation and landing, a Doppler speed and drift angle indicator, and other instruments for aerial navigation in any of the most complex conditions.

The radio communications equipment provides reliable communication between crew members and the ground and other aircraft and among themselves and the flight attendants, as well as for announcements to passengers and the transmission of entertainment programs. Radio communications may be conducted on shortwave or ultra shortwave [frequencies above 30 Mhz]. The stations for both bands have been duplicated.

The aircraft has been equipped with a deicing system to protect the slats, tail assembly, powerplant, cockpit windshield, and certain other subassemblies. The system operates at altitudes of up to 10 kilometers when temperatures of the surface protected are between zero and minus 40 degrees in all flight regimes.

The electropulse principle is being utilized for the first time for the removal of ice on the leading edges of surfaces and the tail assembly. Deicing gear for the airframe, powerplant, pitot head and angle-of-attack indicator can be switched on both manually and automatically.

An air conditioning system provides normal conditions for the vital activity of the crew and passengers, supplying compressed air to start the engines and operate the turbopump equipment for the hydraulic system, heating the cockpit windows, general equipment and the auxiliary powerplant, and for cooling units of navigation equipment. The air in it comes from the engines in operation. The flow of fresh air for each person amounts to 38 kilograms per hour, and the rate of air interchange in the pressurized cabin on the ground is 11.6 exchanges per hour and 15 exchanges per hour at an altitude of 15,000 meters.

In addition to what has been listed, the aircraft also has a pressure regulation system; firefighting, oxygen and emergency and rescue equipment; and on-board facilities for monitoring and recording flight data.

/Operational Data/ [in boldface]

The aircraft's exacting operational features are ensured by the dependable construction of the airframe and the many backups of especially important systems. Its designated service life, established during the project planning, amounts to 30,000 hours or 20,000 landings. Because of the utilization of integral systems for monitoring the operating efficiency of on-board equipment, the time and labor-intensiveness of fixed operations have been significantly reduced. Thus, the labor-intensiveness to perform the takeoff (operational maintenance in accordance with Form A) amounts to 1.4 to 2 man-hours, and the operations last 46 minutes. The most labor-intensive form of operational maintenance (Form B) requires 5.8 to 6.5 man-hours in all and requires 70-80 minutes. The volume of work in accordance with periodic scheduled maintenance also has been reduced.

A progressive and economically most efficient program of technical maintenance and repair "according to condition" is being developed for the Il-86 aircraft.

The procedure for the aircraft's maintenance is not complicated because of the positioning of assemblies and apparatus in accordance with the group principle. And its low height makes it possible to perform most operations without using stepladders. The rational location of points on board makes it possible to switch on all facilities for ground maintenance simultaneously. We have strived through design measures to reduce the labor-intensiveness in the technical maintenance of the Il-86. We hope that the technical and economic indicators of the aircraft make it possible to achieve moderate production cost for air transport, and that both Aeroflot workers and passengers will like the backup systems to ensure reliability, the extent of modern equipment, the facility of piloting, the comfort and the new system of baggage handling.

It is practically impossible in one article to cover all the features of the airbus and to show that putting it into operation will require a definite reorganization of the psychology and established concepts of both the flight and technical personnel--of practically all services connected with preparing for flights and servicing this aircraft. The magazine will discuss this in future issues.

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INTERNATIONAL SYSTEM OF UNITS IN MOTOR TRANSPORT

Moscow AVTOMOBIL'NYY TRANSPORT in Russian No 3, 1980 pp 40-41

[Article by engineer S. Likhachev, instructor of the Tuchkovo Motor Transport Tekhnikum: "The International System of Units"]

[Text] As is known, the International System of Units, which has been adopted in the Soviet Union as the mandatory system, has substantial differences from the systems previously in effect in our country. When introducing the International System of Units (SI), provision was made for the use during the transitional period of both the old units and the new SI units. At present SI is becoming most widespread, it has begun to be used in specialized and even popular literature. The article of engineer S. Likhachev, an instructor of the Tuchkovo Motor Transport Tekhnikum, is devoted to the question of the use of SI units in literature on motor transport.

At present in all technical calculations and descriptions of vehicles it is recommended to use the International System of Units (abbreviated as SI--systeme international), in Russian transcription it is read distinctly as "ES-I." This system of units was adopted in 1960 by the 11th General Conference on Measures and Weights (GCMW).

The considerable expansion of international contacts in the area of science, technology, trade and industry, as well as the need to simplify the previously existing system of units of physical quantities are the ma - reasons for the introduction of SI.

CEMA Standard 1052-78 "Metrology. Units of Physical Quantities" is the main standard document on units of physical quantities, which is obligatory for all CEMA member countries. This standard was introduced in the USSR in December 1978.

SI is patterned after seven main units, two supplementary units and a large number of derived units.

Among the basic units are: the meter (m, м)--a unit of length; the kilogram (kg, кг)--a unit of mass; the second (s, с)--a unit of time; the ampere (A, А)--a unit of strength of an electric current; the mole (mol, моль)--a unit of the amount of a subetance; Kelvin (K, К)--a unit of thermodynamic temperature; the candle (cd, кд)--a unit of intensity of light.

The abbreviation of the units--the international and the Russian--is cited in parentheses.

Among the supplementary units are: the radian (rad, рад)--a unit of a plane angle and the steradian (sr, ср)--a unit of a solid angle.

The derived SI units are formed from the basic units. This can be shown by the example of the definition of the unit of velocity of a linearly and uniformly moving point

$$v = S/t,$$

where v is the velocity, S is the length of the covered path and t is the time of movement of the point.

In place of the length and time it is necessary to substitute the SI units

$$[v] = [S]/[t] = 1 \text{ m/1 s}.$$

The unit of velocity in SI is obtained--with the dimension meter per second.

A number of derived units have been named in honor of scientists. For example, pressure, mechanical stress--Pascal (Pa, Па), force--Newton (N, Н), work, energy, heat--Jule (J, Дж) and others.

The use of SI can be shown by the examples of the main parameters of the technical characteristics of a motor vehicle. First of all, SI eliminates the previously existing confusion in the designation of mass and force.

The vehicle's own mass, the mass of the cargo being hauled, the total mass of the vehicle are designated in kilograms (kg, кг); the braking and tractive force, the force of gravity of the vehicle are designated in Newtons (N, Н). For example, a vehicle with a mass of 1,000 kg acts through the wheels on the surface of the road with a force of gravity (weight) of 1,000 kg X 9.81 m/s^2 or approximately 10,000 N, where 9.81 m/s^2 is the acceleration of free fall. Consequently, when braking on dry asphalt (the coefficient of cohesion of the tire with the surface is $\varphi = 0.7$) the maximum braking force (braking until skidding) can be 10,000 X 0.7 = 7,000 N.

The cubic meter--m^3--will be the unit of volume in SI, but the previous units--the liter and the cubic decimeter (l, л and dm^3, дм^3)--are also allowed to be used.

Thus, the volume of the fuel tank and the consumption of fuel can be measured in liters, the displacement volume of the cylinders of the engine can be measured in cubic decimeters.

Energy, work and the amount of heat in the new system have a single unit of measurement--the Jule (J, Дж). But for the torque of an engine, the momentums in installation operations, for example, the tightening of bolts and nuts, the Newton-meter (N·m, Н·м) should be used, although 1 J = 1 N·m.

Of course, it is impossible, and hardly expedient, in a single day to convert the old designations of the units on all machine tools, hoisting mechanisms, tools and equipment to the new designations.

At motor transport enterprises this will be done in an organized manner.

The watt serves as the unit of power in SI. A watt is the work of 1 J for 1 s. Since a watt is a very small unit, we use a larger unit, the kilowatt, 1 kW = 10^3 W.

In order to convert the power of an engine, which is expressed in horsepower, it is necessary to remember that 1 kW = 1.36 hp or 1 hp = 0.736 kW (Table 1). Of course, the g/kWh will be the unit of specific consumption of fuel, while the kW/dm^3 will be the specific unit of power (the power per unit of displacement volume of the cylinders of the engine).

Table 1

Table for Converting hp Into kW

hp	0	1	2	3	4	5	6	7	8	9
	kW									
0		0,736	1,471	2,207	2,942	3,677	4,413	5,148	5,884	6,619
10	7,355	8,090	8,826	9,561	10,297	11,032	11,768	12,503	13,239	13,974
20	14,710	15,445	16,181	16,916	17,652	18,387	19,123	19,858	20,594	21,329
30	22,065	22,800	23,536	24,271	25,007	25,742	26,478	27,213	27,949	28,684
40	29,420	30,155	30,891	31,626	32,362	33,097	33,833	34,568	35,304	36,039
50	36,775	37,510	38,246	38,981	39,717	40,452	41,188	41,923	42,659	43,394
60	44,130	44,865	45,601	46,336	47,072	47,807	48,543	49,278	50,014	50,749
70	51,485	52,220	52,956	53,691	54,427	55,162	55,898	56,633	57,369	58,104
80	58,840	59,575	60,311	61,046	61,782	62,517	63,254	63,988	64,724	65,459
90	66,196	66,930	67,666	68,401	69,137	69,872	70,608	71,343	72,079	72,814

The unit of pressure in automotive engineering has the most exten e use: the pressure of the air in the tires, of the oil in the engine lubricating system, liquid and air in the brake system, gases in the cylinder of the engine and so on. Pressure is the force which is exerted on a unit of area.

In SI the pascal (Pa, Па) is used as the unit of pressure, 1 Pa is the force of 1 N which acts on an area of 1 m^2.

To make the conversion it should be known that 1 kg/cm^2 = 98,066.5 or approximately 100 kPa (kilopascal). Consequently, the pressure in the tires, which is equal to 3 kg/cm^2, corresponds to 300 kPa (Table 2).

Table 2

Brief Specifications of the ZIL-130

Indicators	Former system of units	SI	Units allowed in practice
Total mass of vehicle. .	9,525 kg	9,525 kg	9,525 kg
Maximum velocity of vehicle.	90 km/h	25 m/s	90 km/h
Maximum power of engine.	150 hp	110,000 W	110 kW
with a rate of rotation	3,200 rpm	53 s^{-1}	3,200 min^{-1}
Maximum engine torque. .	41 kgm	400 J	400 N·m
with a rate of rotation	1,600-1,800 rpm	26.7-30 s^{-1}	1,600-1,800 min^{-1}
Displacement volume of engine cylinders	6 l	0.006 m^3	6 dm^3
Specific (liter) power of engine.	25 hp/l	--	18.3 kW/dm^3
Specific consumption of fuel	250 g/hp·h	$0.095 \cdot 10^{-3}$ kg/J	340 g/kWh
Temperature of engine coolant.	85-90° C	358-363 K	85-90° C
Air pressure in tires			
front wheels	3.5 kg/cm^2	342,000 Pa	350 kPa
rear wheels.	5.0 kg/cm^2	490,500 Pa	500 kPa
Ratio of total mass of vehicle to the maximum power of the engine. . .	75 kg/hp	--	86.6 kg/kWh

When writing down the dimensions of the units the following should be borne in mind. The ratio of the dimensions of the units is written only by way of a slanted or horizontal line. If a slanted line is used, the product of the dimensions of the units in the denominator is inclosed in parentheses. For example, g/(kW·h).

The use of the dimension of units in the form of the product of the dimensions of the units, which have been raised to positive or negative powers, is allowed. For example, the dimension of the unit of the air drag coefficient (Kв) can be written as follows:

$$N \cdot s^2/m^4, \quad \frac{N \cdot s^2}{m^4}, \quad N \cdot s^2 \cdot m^{-4}.$$

The placement of the dimension of the units in the same line as the formulas is not allowed, it should be written both at the end of the last calculation and at the end of all the intermediate calculations. For example:

$$P_в = K_в \cdot F_в \cdot v^2,$$

where $P_в$ is the force of the air drag, N; $K_в$ is the air drag coefficient, $N \cdot s^2/m^4$ ($K_в = 0.3\ N \cdot s^2/m^4$); $F_в$ is any area of the vehicle, m^2 ($F_в = 2\ m^2$); v is the velocity of the vehicle, m/s ($v = 20$ m/s);

$$P_в = 0.3 \cdot 2 \cdot 20^2 = 240\ N.$$

The standard provides for exogenous units (some of them have already been cited in the article), they can be used on equal terms with the SI units without a limitation of the period.

Mass--ton (t, т).

Time--minute (min, мин); hour (h, ч); day (d, сут).

Plane angle--degree--°, minute--', second--".

Volume, capacity--liter (l, л).

Temperature--degree Celsius (°C, °C).

In conclusion it should be said that it will be possible to change the habit of thinking in old units more easily, the more rapidly it is possible to get through the people the need for and expedience of the introduction of the new system of units.

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AUTO SERVICE GUARANTEES DISCUSSED

Alma-Ata AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA in Russian No 3, 1980 p 4

/Interview with Chief of the Technical Division of the Kazakh Republic Avtotekhobsluzhivaniye Specialized Administration Vladimir Alekseyevich Smol'nikov and Director of the Alma-Ata Specialized Motor Vehicle Center of the Volga Motor Vehicle Plant Nikolay Nikolayevich Kaz'min by A. Khmelev: "Guarantees of Auto Service: What Are They?"/

> /Text/ Every motor vehicle frequently has to resort to the assistance of the service stations and the specialized motor vehicle centers of the Volga Motor Vehicle Plant. We asked Chief of the Technical Division of the Kazakh Republic Avtotekhobsluzhivaniye Specialized Administration Vladimir Alekseyevich Smol'nikov and Director of the Alma-Ata Specialized Motor Vehicle Center of the Volga Motor Vehicle Plant Nikolay Nikolayevich Kaz'min to tell about the guarantees which they give to clients.

V. A. Smol'nikov: As is known, the plants guarantee the operation of the vehicle without breakdowns for a year on the condition that during this time it does not cover more than 20,000 km. If a malfunction occurs during that period through the fault of the manufacturer, our service stations remedy it. Breakdowns occur most often on Moskvichi in the engine, the reduction gear of the rear axle, the gearbox, on Zaporozhetsy also in the engine and the rear axle.

Correspondent: What are the guaranteed times for filling orders?

V. A. Smol'nikov: We carry out the servicing and preparation of motor vehicles for maintenance inspection in two days. Routine repairs--in 15 days. Painting (with the removal of the old paint)--in the same time. Complicated sheet metal and welding operations (they are most often required after accidents)--in a month and a half.

Correspondent: The work has been completed. During what length of time can the client complain to the service station if the repair work turns out to be of poor quality?

V. A. Smol'nikov: For servicing and preparation for maintenance inspection we guarantee the quality for 10 days, on routine maintenance of vehicles, units and assemblies--for 1 month; on the painting of the car body--6 months.

Correspondent: How is the quality of the work being performed monitored at the service station?

V. A. Smol'nikov: Its check is made both during the filling of the order and after completion of the work. It is carried out using instruments and equipment or by external inspection. The acceptance of a filled order is recorded by the service station inspector in documents. The client has the right to check the work, by inspecting the assemblies, as well as by giving the vehicle a road test.

Correspondent: And if the quality nevertheless proves to be unsatisfactory?

V. A. Smol'nikov: Then the station is obliged to remedy without charge within three days the defects discovered during the warranty period. But this occurs only if the driver meets all the requirements of the operating and maintenance instructions and does not break the seals. If this is not done and the warranty period has expired, the service station declines responsibility.

Correspondent: Let us imagine the following situation. Disagreements over the appraisal of the performed work have arisen between the client and the performers.

V. A. Smol'nikov: Such cases are reviewed by a commission of experts with the participation of a representative of a disinterested organization.

N. N. Kaz'min: As to the Volga Motor Vehicle Plant, we can say the following. The plant is extending the warranty period for the Zhigulis VAZ-2101, 2102, 21011 and 2103 to 1.5 years. Moreover, work is now being performed on improving the quality of the engines. Obviously, soon their guaranteed life will be increased to 180,000 km. The strength of the spiders, as well as of the "crank-camshaft" pair will increase significantly.

Correspondent: What guarantees does the specialized motor vehicle center give for the period and quality of the performance of work? Do they differ from those which the service station offers?

N. N. Kaz'min: We are trying to carry out servicing in one shift. Of course, violations of the schedule also occur. This happens most often in the summer, when the motor vehicle center is literally choking with an influx of vehicles. During the year we receive 30,000 orders, we fill 21,000-22,000 of them in a day. In order to achieve such a result, we have introduced a 1.5-shift workday, from 0700 to 2100. To guarantee the quality the group of the chief engineer is introducing a comprehensive system of quality control.

This year the monitoring and diagnostic equipment and special tools will be updated. We will complete the reequipment by May.

The quality of the work also depends on the experience and skills of the performers. We have now made more rigid and have expanded the personnel training program. For this we will use the latest and most diverse means.

It has been decided to organize Days of Open Doors at the motor vehicle center. When they are held, we plan to deliver lectures for motorists and to conduct classes with them on proper operation. We need a competent motorist.

Correspondent: How do you review conflict situations?

N. N. Kaz'min: If the Zhiguli owner does not trust our specialists, we either call a worker from the plant to resolve the conflict or on the request of the Volga Motor Vehicle Plant send all the materials and the defective parts there. The causes of the malfunction are established there in special laboratories.

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CURRENT ACTIVITIES AT ZIL

Alma-Ata AVTOMOBIL'NYY TRANSPORT KAZAKHSTANA in Russian No 3, 1980 pp 24-25

/Article (NOVOSTI PRESS AGENCY): "The Rhythms of ZIL"/

> /Excerpts/ The reputation of the items of the Moscow Motor Vehicle Plant imeni I. A. Likhachev--the firstling of the domestic automotive industry--is well known not only in our country, but also far beyond its borders. The Russian "ZIL" is pronounced today without hesitation and with respect in nearly 50 countries of the world, to which about 20 percent of the products produced by the plant are exported.

Today the ZIL Association is a mighty production economics complex. More than 1,000 automatic and mechanized flow lines and 60 completely mechanized shops and sections are in operation here. The mechanization of handling, warehousing and auxiliary operations exceeds 90 percent. The mighty complicated complex is operating synchronously, in precise rhythm. ZIL annually provides the national economy of the country with more than 200,000 trucks, refrigerators and spare parts of 2,000 descriptions.

It cannot be otherwise, for a new truck comes off the conveyor every 108 seconds. But due to the intense rhythm the demands on quality are not being lowered in the least, and the products of the plant are truly of high quality.

The collective of the Administration of Design and Experimental Operations is also working intensely. The designers are always trying to be ahead of the times. When the series-produced ZIL-130's were coming off the conveyor, they were thinking here about a new, more productive and improved vehicle, which would incorporate all the best that exists in world truck building. Now such vehicles have been developed. They are the ZIL-133GYa and the ZIL-169 with diesel engines.

Today the plant is affording the working man great opportunities to improve his occupational skill. ZIL is not only an industrial combine, but also the largest production training combine in the country. Various course for the

training of workers of the mass professions, a vocational and technical school, a school of foremen, a tekhnikum and a plant higher technical educational institution, at which the training has been organized according to two schedules--day and evening--are in operation here.

But let us return to the Administration of Design and Experimental Operations.

"How do the new, more powerful ZIL's, which are replacing the current vehicles, look?"

"Their appearance is quite modern. They are equipped with three-seat all-metal cabs, are provided with curved windshields on the twin-axle trucks and with flat windshields, which are installed at an angle, on the three-axle trucks."

It remains to be added that today more than 20 such trucks and 50 test diesels are already being tested. They are all "taking exams" at special plant testing grounds. Some models of the trucks have already been readied for interdepartmental acceptance tests.

Photo caption: The assembly of the new ZIL-133GYa trucks with a load capacity of 10 tons and a KamAZ-740 diesel engine has begun at the motor vehicle assembly building of the Moscow Motor Vehicle Plant imeni Likhachev.

The new truck is equipped with a four-circuit system of brakes which ensure the greatest traffic safety.

In the picture /photo not reproduced/: the first new ZIL-133GYa truck.

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KAMAZ SERVICE CENTERS

Moscow AVTOMOBIL'NYY TRANSPORT in Russian No 2, 1980 pp 16-17

/Article by G. Tarakanov: "The KamAZ Motor Vehicle Centers--The First Steps and the Problems"/

/Text/ "With the appearance of the trucks of the Kama Motor Vehicle Plant," relates Chief of the Tula Motor Vehicle Center Boris Grigor'yevich Chernyak, "the question arose: what is the best way to organize maintenance and service? For it is impossible to handle them in the old way. Specially equipped service areas have to be created. A set of special tools is necessary for repair work. Specific types of oils and special working materials are required. Not to meet all these requirements means to shorten the term of their operation. The Kama Motor Vehicle Plant with the agreement of the ministries of motor transport of the union republics is setting up a network of motor vehicle centers in the country. Their task is to provide the owners of KamAZ's on time with spare parts, to monitor the use of parts, to keep track of how the operating instructions of the trucks are being observed and to help the collectives of motor transport enterprises."

Such a motor vehicle center appeared in Tula a year ago. It is directly subordinate to the Kama Motor Vehicle Plant. The collective of the motor vehicle center has established strong contacts with enterprises.

It is now already possible to draw the first conclusions. The service of the trucks has been set up best at large managements--the garages and columns of the Oka River Region Territorial Transport Administration, the Priokskstroytrans Trust and the Mosbassshakhtostroy Combine. The majority of the trucks of the oblast are concentrated at them. The specialists of these organizations were trained at the plant and have held classes at their educational course combines with the drivers and repairmen, foremen and mechanics, who deal with KamAZ's.

Special sections for KamAZ's--areas for their servicing--have been provided at the enterprises.

At the Production Association of Truck Transport No 1, Motor Column No 1135, the Sixth Garage of the Priokskstroytrans Trust the roadworthiness of

the KamAZ's is 0.915. Ye. S. Trubitsyn, A. D. Yevdokimov, A. I. Papov and F. V. Polyanskiy, drivers from these managements, have increased the mileage of KamAZ's without routine maintenance to 150,000-170,000 km. Some brigades of drivers have assumed the obligations to increase the mileage of the trucks without an overhaul to 500,000 km.

The productivity of KamAZ's is also high. At Motor Column No 1135 120,000 tons of freight were hauled in 40 trucks, while the freight turnover was 13,250 ton-km. The specific consumption of fuel is nearly two-thirds of the norm.

Such are the results of the use of KamAZ's at major motor pools. The picture is different where there are from two to five trucks, for example, at the Yefremovskiy and Kireyevskiy rayon Sel'khoztekhnika associations, the Tul'skaya Oblast Administration of Grain Products, the garage of the Tulaugol' Association and the Kosaya Gora Metallurgical Plant. Here the results are somewhat lower. The trucks are used, as a rule, without trailers. Competent servicing, which it is unsuitable and inconvenient to carry out due to the small number of trucks of this make at each such management, has not been organized.

The question automatically arises: is such a dispersion of powerful trucks wise? In our opinion, it would be much more profitable to allocate KamAZ's to large motor pools, which are able to set up their proper maintenance by specially trained drivers and repair brigades and to use them more efficiently.

The State Motor Vehicle Inspectorate could also have intervened in the procedure of distributing KamAZ's: it might have not registered them at small managements, where the conditions do not exist for the high quality servicing and repair of heavy trucks, for this is an important factor which influences traffic safety.

There are also other unsolved problems in the organization of the service of new trucks. It is well known that KamAZ's cannot get by without special lubricants. However, at the Tul'skaya Oblast and many interoblast tanks farms of the RSFSR State Committee for the Transport and Supply of Petroleum and Petroleum Products there are not enough of them, the necessary variety does not exist. The situation is even worse with A-40 brake fluid and ethyl alcohol, which are used in the brake and cooling systems of the truck. Without them it is practically impossible to operate the trucks.

The Tula Motor Vehicle Center is in operation. Its most important concern, until it gains strength, is the supply of its "wards" with spare parts. In the future this enterprise, which is well furnished with special equipment for maintenance and has been manned with a staff of repairmen, will become a kind of sanatorium of KamAZ's.

The motor vehicle center of the Kama Motor Vehicle Plant in Ul'yanovsk has been in operation about two years. During this comparatively short period it has gained the recognition of the motor transport worker.

The supply of motor pools with spare parts, the supervision of the operation of trucks and the gathering of information on breakdowns and the wear of parts and assemblies have become a constant concern of the motor vehicle center.

Three groups have been set up at the motor vehicle center.

The claims group examines all complaints of motor transport enterprises against the Kama Motor Vehicle Plant. Mechanics of the motor vehicle center go to the sites and remedy all the defects at the expense of the plant.

The observation group keeps track of the operation of trucks after the warranty period and monitors the use of spare parts.

The distinction of the motor vehicle centers of the Kama Motor Vehicle Plant from other supply organizations is that here they do not issue spare parts for future use, but only in exchange for those which have failed. On the national scale such a system of supply promises an enormous saving from the elimination of warehouses at motor transport enterprises.

The information group gathers, generalizes and transmits via teletype to Naberezhnyye Chelny data on all the failures of assemblies and parts, which occur in Ul'yanovskaya and Penzenskaya oblasts (the zone of jurisdiction).

On Mondays this information is received from the motor pools, on Tuesday it is already at the plant, where it is processed and helps the plant to increase the reliability of the vehicles, to reduce their idle time and to plan the production of spare parts.

The motor vehicle center also has its own problems. The motor transport workers do not always inform it on time about the idle times of trucks. The motor vehicle center does not have vehicles for the prompt delivery of spare parts to the motor pools, especially during the harvesting of the crop.

More than 20,000 KamAZ's are now in operation at the enterprises of the RSFSR Ministry of Motor Transport. They have proven themselves well in interurban transportation, in the mass transportation of grain from the threshing floors to the grain receiving centers, of freight from railroad stations and in the centralized transportation of construction materials.

For the effective use of these trucks it is very important to provide the motor transport enterprises with a trailer fleet. On the basis of the available experience it is already now becoming clear that in the future there should be three semitrailers for every truck tractor and not less than one or two trailers for every truck with sides. This will make it

possible to develop the transportation of cargo with interchangeable semi-trailers and trailers.

Using extensively the experience of the Volga Motor Vehicle Plant, which has proven its worth, the Kama Association is setting up a system of firm service, repair and the supply of its trucks with spare parts, units, instruments and assemblies--a network of territorial motor vehicle centers. The RSFSR Ministry of Motor Transport is taking a direct part in their organization. At present 36 such centers are in operation in the RSFSR.

But life already now has demanded the improvement of the system of firm service. For the present the questions connected with the overhaul of units and assemblies at the plants of the Kama Motor Vehicle Plant are being solved slowly. The association is repairing engines in an amount which does not meet the needs of the sector. The overhaul of other units has not yet been organized, yet enterprises are experiencing an acute need for the overhaul of instruments of the electrical equipment, equipment of the brake system and several other units.

With the appearance of KamAZ's in motor transport another problem arose--the designing and production of special tools, garage and diagnostic equipment. The designers and process engineers of the Kama Association could have done this more rapidly and better. The creators of motor vehicles should take into account the maintainability of the units, assemblies and the vehicle as a whole, as well as determine the schedules and periodicity of service. The specialists of the manufacturing enterprise know better, what tools and equipment are necessary for the perfomance of work connected with the service and repair of the equipment produced by them.

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SHORTAGE OF ZAPOROZHETS SPARE PARTS

Moscow TRUD in Russian 8 Apr 80 p 2

/Article by N. Akritov (Kaluga-Moscow): "To the Secondhand Market for Parts"/

> /Text/ "I had a mishap: I broke the headlight and parking light on my Zaporozhets. I turned to the service station. We do not have, they say, those spare parts. I went to a second, a third--the same answer. It is not clear what is wrong. Are they not producing enough of these spare parts, or are the motor vehicle service stations not interested in 'taking trouble' over such small things?"
>
> A. Azamatov, World War II invalid
>
> Volgograd

Let us say immediately that we found ourselves voluntarily in the situation about which Comrade Azamatov writes. We removed from our Zaporozhets the headlight and parking light, while the muffler was burnt through. With these "damages" we set out.

In Moscow, at Service Station No 9, which is on Dmitrovskiy Highway, at that time there were few visitors. Dozens of vehicles were crammed into the yard of the station. The receiving clerk, who was busy with her work, did not hear our question, and we repeated again:

"Can you replace a headlight, parking light and muffler?"

"We do not have those parts and we do not know when we will. Our orders have not been filled now for a year and a half," was the response.

We were greeted in approximately the same way at Motor Vehicle Service Station No 2 on Izmaylovskiy Prospekt.

The Moscow stations, which specialize in the repair of Zaporozhetsy could not serve us: they also did not have the necessary parts. So we decided to try our luck in the Moscow suburbs.

In Noginsk the service station, as they say, is on the level of current requirements: the building is beautiful, the show windows and the stands with all kinds of reports and samples for filling out documents are well designed. They were unable to remedy the "troubles" in our Zaporozhets here as well.

The Orekhovo-Zuyevo station greeted us with a clean vestibule. The bored receiving clerks answered all our questions unequivocally: "There are no spare parts. The manufacturing plants are not delivering."

Similar answers were also heard at the remaining service stations of the oblast: in Serpukhov, Solnechnogorsk and Klin.

Our search for spare parts was also unsuccessful in Kaluzhskaya Oblast.

It must be said that V. V. Sementovskiy, chief of the Division of Spare Parts and Marketing of the AvtoZAZ Association, participated with me in this unique experiment (we traveled more than 800 km). He knew better than anyone about the supply of Zaporozhetsy with spare parts! And we sought for spare parts, the plan on the output of which the association is fulfilling and even exceeding. Including headlight rims, mufflers and fenders.

"Our enterprises are producing more and more spare parts. But the orders for these spare parts for some reason are decreasing annually! The service stations are ordering fewer and fewer of them. They say: 'There are no needs...'."

But we were convinced that a need exists. So what is the matter? One of the reasons is that they do not know the demand for certain parts or others at any station. Moreover, they do not want to know this. For example, Director of the Orekhovo-Zuyevo Motor Vehicle Service Station V. I. Kushnir could not say how many spare parts and what kinds the station requested for the year. No order documents were found. In Serpukhov they ordered 10-15 each of the spare parts of interest to us for the year.

Having ascertained that in Moscow Oblast there are about 25,000 Zaporozhetsy of them more than 18,000 ZAZ-968's, we identified the technical norms and calculated that a minimum of 600 spare mufflers and 2,000 parking lights are required annually for such a number of vehicles. But each year the Mosoblavtotekhobsluzhivaniye Association orders only 150 mufflers and the same number of parking lights.

It also proved impossible to find various bearings, gears, gaskets, liners and tappets for the repair of the gearbox and engine. Why are they not available at the stations?

"They are not being allocated, although they are very necessary," says Chief of the Mosoblavtotekhobsluzhivaniye Association V. V. Kaplin.

Unfortunately, documents refute these words. Not one spare part for the repair of engines and gearboxs, about which Kaplin said: "They are very necessary," is even mentioned in the orders. The stations are taking the line of least resistance--they order assembled units and assemblies.

"We should not repair major assemblies," concluded deputy chief of the association N. A. Khartsiyev, showing that he was tired of having it out with us, "read the Statute on the Service and Repair of Passenger Cars Belonging to Citizens, everything is clear there. To help the car owners, we order engines and other assemblies as a whole and put them in the cars."

In the statute everything is indeed clear. And if Comrade Khartsiyev would read it carefully, he would know that this document obliges the stations either to install the assembled new assembly or to replace the parts in this assembly, which have failed.

But it is profitable for the oblast motor vehicle service to follow only the first paragraph of this statute.

In Moscow, at Specialized Motor Vehicle Service Station No 3, which is on Ulitsa Zorge, a centralized system of production control was introduced a year ago. The station orders everything--small and large spare parts--and the manufacturing plants fill the orders quite precisely. But the motorist hears here as well the familiar response: "The spare parts you need are not available." But this time they are lying idle in the central warehouse.

Thus, last year the stations took from the central warehouse of spare parts of Mosavtotekhobsluzhivaniye only 42 gaskets for axle shafts, but 250 assembled axle shafts. At the station they do not replace gaskets, they offer an assembled axle shaft, citing their inavailability. And you will pay 20-fold more for this. Meanwhile 500 new gaskets have been lying in the warehouse since 1978.

Thus, why do the stations not want to engage in minor repair work? Because it is very inexpensive. It is more simple to fulfill the plan on expensive orders--it is easier and quicker to deliver 5 new engines than to replace 400 parking lights.

"The stations will engage in minor repair work," V. V. Sementovskiy convinced me, "only if the RSFSR Ministry of Motor Transport along with USSR Gosplan plans for them the number of serviced vehicles, the minor repair work, the servicing, the large-scale work and so on. It is possible to correct the existing situation and to spare car owners from the grip of an artificial shortage in the near future. Lists or booklets with a list of parts of greater than usual demand, according to which the stations will be obliged to have these parts in the necessary numbers, might be the first step in this direction. AvtoZAZ in turn is obliged to provide all stations

with 100 percent of these parts. The motor vehicle service stations will be obliged to have these spare parts."

This is one of the ways out of the paradoxical situation which has formed. Perhaps there are also other alternatives. But for the time being.... With the slightest failure of a vehicle the owner buys the part where he has to, most often from speculators, and replaces it himself or with the help of "left-handed" experts. For 50 percent of the Zaporozhetses are hand-operated, their invalid owners cannot repair the cars themselves. And, having given up hope of remedying trifling problems at the stations, they are forced to agree to the replacement of the entire assembly. They have to spend a lot of money, but for the present they do not have another solution.

A strange thing happens: one part out of a hundred in an assembly broke, the remainder could work for a long time yet, but they are thrown out. When we break a shoelace, we buy precisely it, we do not go to the store for new shoes.

Such service is to the disadvantage not only of car owners, but also of the entire national economy. The state is forced to waste millions of rubles, to overconsume thousands of tons of metal and to take up production capacities. We have not yet spoken about what truly extensive freedom this artificial shortage creates for various kinds of speculators and rogues.

We returned to the editorial board empty-handed. They did not supply us with the parking light and the headlight with the rim anywhere--not at the stations of Kaluzhskaya and Moscow Oblasts and not in the capital. Near home, while putting the removed parts in place, I began to think: but what if they really break the parking light, will they have to replace the entire fender?

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NEW RULES FOR RAILROAD OPERATIONS

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 11, 79 pp 42-46

[Article by I. V. Kharlanovich, deputy chairman of the Ministry of Railroads Scientific and Technical Council]

[Text] A resolution for the development of the new rules for railroad operation (PTE) and a new handbook on signaling was adopted at the beginning of last year. The new Rules should promote an increase in the efficiency with which railroad transport resources are used, based on the broad introduction of scientific and engineering achievements, progressive technology and advanced work methods.

Thousands of railroad workers participated in preparing the new Rules. About 1,300 proposals were received at the Central Editorial Commission of the MPS [Ministry of Railroads]. All of them were examined carefully. Changes and additions to 197 items were made; 9 new items were included and 6 were discarded. Changes in 58 items were made in the Signaling Instructions. Three new items were added and 12 were discarded.

After examination at the Plenum of the Scientific and Technical Council and the College of the MPS, the new Rules and Signaling Instructions were approved by the Ministry of Railroads 5 July 1979, and they become effective 1 January 1980 by order of the Ministry.

The currently prevailing Rules of Operation were approved in 1970. During the period which has passed, the traffic capacity and the carrying capacities have grown significantly on the railroads. Construction of dou le tracks is underway and automatic block signaling, dispatcher centralization and automatic locomotive signaling is being introduced more rapidly. The heavy R65 and R75 rails which permit the speed of passenger and freight trains to be increased are being laid on the line. The rolling stock is being supplemented by powerful VL10, VL11, VL80, and 2TE116 locomotives and more modern types of cars, including 8-axle cars. Computer installations have received broad dissemination and an automated railroad transport control system is being developed.

The explosion in the country's economy naturally increases the intensity of railroad operations. Freight turnover has risen almost 38 percent and cargo shipment over the system has increased from 18.5 million to 24.5 million T-km per kilometer on the average. Under these conditions, it is particularly necessary to improve the use of the technical resources of transport, to improve their reliability and to broadly incorporate new equipment and up-to-date engineering and a more perfect organization of labor.

All of this caused the reexamination of the currently prevailing Rules of Operation and Signaling Instructions, the Handbook on Train Movement and Switching Operations and other handbooks and directives of the Ministry of Railroads associated with it, with the aim of increasing the efficiency and the quality of operations.

In the section "General Responsibilities of Railroad Transport Workers," it is emphasized that, along with fulfilling the plan for passenger and freight transportation while unconditionally assuring traffic safety, the efficient use of equipment, the search for resources and the constant increase in labor productivity and reduction in transportation, costs are also primary obligations of railroad transport workers.

In the new Rules and Signaling Instructions, a new numeration of the items (paragraphs) has been introduced in accordance with the prevailing GOST [state standard]. Changes in terminology have been introduced: "powered vehicle transport," has been replaced by the term "means of transport," and "technical inspection" has been replaced by the term "maintenance work," etc.

The new Rules have been brought into full accordance with the construction norms and rules for designing 1520 millimeter-gauge railroads.

The currently prevailing Rules were based on the calculated maximum permissible speeds for passenger trains being 120 km/hour, and 80 km/hour for freight trains. The new Rules specify a maximum permissible speed of 140 km/hour for passenger and 90 km/hour for freight trains. In accordance with this, all the structures and equipment of the railroads should satisfy requirements insuring passage of trains at the greatest established speeds.

On sections where train speeds greater than 140 km/hour for passenger and 90 km/hour for freight trains are permitted, the norms for maintenance and the operating procedure are established by special instructions from the Ministry of Railroads.

Considering that the indicated speed cannot be realized everywhere throughout the railroad network, the accepted standards for maintaining structures, equipment and rolling stock with a train speed of up to 120 km/hour for passenger and 80 km/hour for freight trains are retained in the new Rules, the Rules being composed so that at first the standards for maximum traffic speeds are given and then for existing speeds.

In the chapter "Structures and Equipment," it is said that they should be maintained in working order.

The chapter "Track Facility Structures and Equipment" has been supplemented by a new point establishing that "the arrangement and the technical equipment of track sectors, track machine yards and other track facilities should ensure performance of the necessary operations for maintenance and repair of the railroad track, structures and equipment for meeting the desired traffic volumes with the set speed."

In connection with increasing the maximum passenger train speeds to 140 km/hour, the requirements for the arrangement of stations, sidings and passing sidings have been toughened in the plan. Under difficult conditions, their location is permitted on curves with a radius of no less than 1500 m. The width of the road bed should correspond to the upper structure of the track and have shoulders no less than 0.4 m wide on each side of the track (this has been established for the first time).

According to the list approved by the line chief, bridges and tunnels are blocked by standard-sized control equipment and are equipped with warning signals and blocking light signals.

Item 2.3 (Section 17) is supplemented with an instruction to the effect that cargo which cannot be positioned on open rolling stock within the confines of the loading dimension are conveyed by the procedures established by the MPS. Standard-sized portals are being installed at mass loading sites (on sidings, and sea and river ports, and at transfer points) to check the accuracy of cargo placement within the limits of the indicated dimensions.

Item 3.1 (Section 18) has been newly formulated. It was previously written that all of the elements of the railroad track should insure safe and smooth train traffic with the highest designed speeds established for locomotives in operation on a given sector with regard to strength, stability and their condition. With new locomotives having higher design speeds, these sections of the Rules cannot be complied with at the given time. In association with this, it has been written in the new Rules that all components of the railroad track should insure safe and smooth traffic at the highest speed established for a given section.

It is permitted in Item 3.10 (Section 25) to maintain one rail 5 millimeters higher than the other on straight sections of the line along the entire length of each of them (the existing norm is 4 millimeters), whereas the values of permissible deviations from the norms at the level of rail positioning on straightaways and curved sections of the line are established by the MPS (4 millimeters was permitted in the prevailing Rules).

Two new items concerning rail requirements were introduced. It is specified in Item 3.13 that rails on the main line and at station tracks should correspond to the operational conditions (freight traffic, and the rates and speeds of the trains) with regard to their strength and their condition. Concrete limiting standards for railhead wear as a function of their type and the permitted traffic speed are set forth in Point 3.14.

Testing the condition of switches on main, receiving and departing tracks at stations is performed using flaw detector car to improve their maintenance.

It has been specified by Point 3.16 (Section 25) that guard rails should be installed before the points of all facing switches on all main lines. Item 3.17 (Section 30) is supplemented by requirements for maintenance of the movable centerpiece of the frog. Mandatory outfitting of the movable frog centerpiece with devices to make locking them with hinged locks possible, as well as outfitting non-interlocking switches leading to tracks designated for flaw detector cars, track recording cars and track equipment to stand with control locks is specified.

The classification of crossings is made more precise by Item 3.24 (Section 37). Earlier they were subdivided into guarded (the presence of a crossing attendant was meant) and unguarded. Such a classification is not true. All crossings on the railroads are guarded. The existing signals of various types are the corssing guard, signaling danger.

It was established by the new Rules that crossings should be with crossing gates or without crossing gates, depending on the rate and speed of train traffic and the means of transport, on their being equipped with crossing signal devices as well as on visibility conditions. More precise definitions were also introduced for the following points about crossings in accordance with this.

Item 4.2 (Section 49) has been supplemented: "sewage plants should provide for the removal and purification of the effluents from the railroad enterprises and housing villages," whereas it has been written in Item 4.4 (Section 51): "it is forbidden for rolling stock to occupy a holding track for maintenance and fire trains and maintenance railcars for the catenary system."

In Chapter 5, "Station Structures and Equipment," all of the changes are directed at creating better working conditions for the transport workers and improving the level of passenger service, while providing unconditional safety for train traffic.

Large passenger stations should have automatic train departure indicators, information devices, ticket vending machines, as well as automatic baggage storage facilities.

It is permitted to install only operation and control equipment directly related to the work of the attendant as well as control panels for centralized control of the lighting and remote control of the section circuit-breakers in the service chambers of the depot's station masters to improve the working conditions of workers association with train movement.

The requirement for retaining standard dimensions when repairing the track and freight and passenger platforms has been strengthened.

At stations the mouth of switches should be illuminated along with the track illumination. At intermediate stations with a small volume of cargo operations, devices for turning external lighting of the loading and unloading and other station tracks on and off by section when cargo and switching operations are not in progress on these tracks should be specified in order to save electricity.

Equipping the approach tracks to the hump with automatic locomotive signals is specified to increase the traffic capacity of these yards. At stations with mechanized hump yards, there should be workshops for repairing the hump-yard equipment.

The standards and the order for maintenance work on structures and equipment for signaling and communication are set down in Chapter 6.

Semiphors have been excluded from the Rules as a means of signaling because there are about 1,000 semiphors in the railroad network which will be replaced by signal lights in the near future.

It is specified by Item 6.3 (Section 62): "...signal lights are to be used as permanent signals on the railroad network; on sections where semiphors have not yet been replaced with signal lights, the procedure for their use is established by the 'Handbook on Train Movement and Switching Operations.'"

Requirements for signal visibility are being increased in order to insure safe and uninterrupted train traffic: stop signals must be visible at a distance of not less than 1,000 m and proceed signals at a distance of no less than 200 m.

In the event there is inadequate clearance for installing entry signal lights on the right hand side, it is permitted to install them on the left side (in the direction of traffic) for admitting trains traveling on the wrong tracks as well as for pushing locomotives and maintenance trains returning from the open line by the wrong track to the station. The necessity of such an installation is determined by the road supervisor.

At large stations (non-class and class one) when trains depart from tracks which do not have adequate length, when the head of the train is beyond the exit light signals, installing a secondary light signal head on the backside of the signal is permitted. The procedure for using such a signal is determined for each individual station by the road supervisor (Item 6.1)

It is also specified in the new Rules that both the exit light signals and the station route signal should be supplemented by indicators regardless of the traffic volume. This is very important for increasing traffic capacity.

Restrictions on the use of entry-light signals for non-stop passage of trains along lateral station tracks have been rescinded.

The requirements for automatic and semiautomatic blocking devices have been increased. They should not permit arbitrary shutting-off of the light signal when shifting from primary to reserve power and back. The transfer time should not exceed 1.3 seconds.

An important supplement to Item 6.19 has been introduced to increase traffic capacity: "...on individual lines with heavy freight traffic and on sections of open line with 2-track sections (according to a list established by the MPS), automatic blocking is to be supplemented by devices making train traffic in both directions along each of the tracks possible." This will permit maneuverability in the organization of traffic for construction and repair operations, particularly during the period when "windows" are available.

At stations located on lines with semiautomatic blocking, the use of devices to control the freedom of tracks and switches is specified.

On stretches of open line adjoining the station equipped with electric interlocking, the use of track blocking or, as was specified in the Rules for the first time, of automatic locomotive signaling suitable as an independent means of signaling and communication is, as a rule, required (Item 6.29). Other means of signaling and communications may be used in these cases only by permission of the road supervisor.

When train traffic moves only based on the aspect of locomotive light signals, these signals should show their aspect as a function of the block-sectors being open or occupied ahead. The receiving and departure tracks along which non-stop passage of trains with a speed of 50 km/hour and more is specified (Item 6.31), should also be equipped with automatic locomotive signaling devices, one after another in a planned sequence, along with the main lines.

On the sections where automatic locomotive signaling is used as an independent means of signaling and communication, warning light signals are not installed before the entry signals (Item 6.5).

Because of the increased role of automatic locomotive signaling and radio communications, it has been specified that the chiefs of signaling and communication sectors and locomotives depots and their deputies should test the stability of these devices' operation.

There should be train communication by radio on all sectors of the line, not only those using electric and diesel power.

The introduction of new types of communications, informational and data transmission to a computer center, has been specified.

There should be electric dispatcher communications not only on electrified sections, but on all sections with intensive train traffic, which are equipped with automatic blocking. Connecting the telephones of the engineers on duty at signaling and communications sector offices to the lines of train dispatcher communications is permitted.

It has been specified that the normal position for switches is to be indicated by a plus sign in Tables of the Interrelationship of Switches, Signals and Routes. Furthermore, for stations with non-interlocking switches, their normal position is indicated in the station's technical and administrative acts and extracts from them.

The new Rules are more specific about standard decisions on signaling, interlocking and blocking equipment, which are approved by the head of the Main Administration of Signaling and Communications of the MPS.

A device for automatic detection of hotboxes is widely used at present throughout the railroad network to increase the safety of train traffic. It is written in Item 6.37: "special devices are being installed for automatic, contact-free detection of hotboxes on passing trains and transmission of pertinent information to this effect to the locomotive engineer and to the station up the line. The order for the location of such devices, their operation and maintenance is established by the MPS's handbook."

Track equipment, signaling, interlocking and blocking devices (SIB devices), electric power-supply equipment and rolling stock should insure constant reliable operation of the electrical rail circuits. The order for maintenance and the norms for maintaining these devices are determined by the MPS (Item 6.51).

The primary requirements for electric power-supply structures and equipment are set forth in Chapter 7 of the Rules. The constant availability of a backup power source from storage batteries when available is specified for uninterrupted operation of the SIB devices and crossing signals in the case the ac power is shut off. The condition of the electric power-supply structures and equipment and measurement of their parameters should be monitored periodically by laboratory cars equipped with diagnostic apparatus.

Individual standards concerning the voltage levels on santographs of the electric rolling stock are specified more precisely, and the values of the normal voltage of current on the SIB devices are indicated. They should be 115, 230 or 380 volts, a deviation of not more than a ten percent reduction or no more than a five percent increment in the indicated voltage rating values being permitted (Item 7.2).

Item 7.8 (Section 121) has been entirely reformulated:

"The catenary system and the lines for automatic blocking and electric power supply along the track with a voltage greater than 1000 V should be divided into individual sectors (sections) using overhead intervals (insulating couplings), neutral inserts and sectional and cut-in insulators. The catenary supports installed at the edges of the overhead intervals should have a distinctive coloration. Stopping electric rolling stock with a raised santograph is prohibited between these supports."

The chief of the electric power supply sector is charged with the responsibility of designating appropriate persons to teach the workers from other services who are designated for switching the section breakers.

The order of examination of structures and equipment and their repair is established in Chapter 8.

"Technological windows" of 1-2 hours duration (Item 8.3) are specified for a performance of current track, artificial structure, catenary, and SIB device maintenance operations. Closing an open-line section to perform work on a single-track sector or on a double- or multiple-track sector on one or several tracks is done with the permission of the head of the railroad department in concordance with the traffic service chief, if it does not cause changes in the set traffic volumes with neighboring lines. If such a closing causes changes in the set volumes of train traffic on neighboring lines, it may be permitted by the railroad head in concordance with the main traffic administration of the MPS.

The procedure for opening a section of open line and restoring existing SIB communication and electric power supply equipment to action is specified more precisely in Item 8.9: "Existing SIB, communications, and electric power supply equipment are restored to operation upon receipt of notification from the senior SIB and communications electrician or the energy dispatcher, as appropriate."

Additions and changes have been made in the section "Rolling Stock." It is specified in Item 9.1 that "The rolling stock should be kept in working condition, insuring its uninterrupted operation and safety of movement. Preventing the appearance of any kind of troubles whatsoever, and providing for the established service lives of the rolling stock should be the primary task of persons responsible for its maintenance.

As a supplement to the requirements specified by the present Rules, the MPS will publish directives for maintenance, repair and operation of rolling stock in operation in passenger trains at speeds of greater than 140 km/hour or freight trains at speeds greater than 90 km/hour."

Switch engines should be equipped with devices for uncoupling them from cars from the engineer's cab, a fact which is very important when the switcher is being operated by the engineer alone.

Concrete permissible norms for wheel wear have been established as a function of train speed.

Some freight cars should have a cross-over platform with an emergency brake and a hand brake. The emergency brakes in passenger cars and powered rolling stock are installed on the platforms and are sealed inside the car.

Responsibility for the technical state of the automatic couplers and correct coupling of the cars in the train is assigned to the car inspector performing maintenance on the train before departure. At stations where there are no inspectors, when cars are connected to the train, as well as during switching, the switching supervisor is responsible for proper coupling of the cars (Item 11.6).

The new Item 12.5 specifies that locomotives and powered rolling stock should be examined by a commission following a procedure agreed upon by the MPS twice a year (spring and fall).

There should be inspection points for examining locomotive automatic stop devices and automatic locomotive signaling devices not only at the main depots, but, when necessary, at maintenance and locomotive turn-around points.

Requirements for performing car maintenance have been increased. A check of the working order of the body which will guarantee the safety of cargo and the working order of cross-over platforms, special foot boards and hand rails, is specified (Item 12.12).

A procedure for maintenance and repair of cars in trains has been made more precise (Item 12.13). At train classification and break-up stations and, while in route, at stations specified by the train traffic schedule, each car of the train should undergo maintenance and be repaired when necessary. Car repair is organized at these stations without uncoupling.

At stations where there are no sites for preparing cars for transport or no maintenance points, each car should be inspected and prepared for travel to the nearest station having a maintenance point before being put into the train. The order for presenting trains for maintenance and for notification of their readiness as well as the order for examination and repair of cars before being placed into a train at stations where there are no points for preparing cars for transport for maintenance points are set by the road supervisor.

Workers at the indicated points bear the responsibility for traffic safety and for cars traveling without coming uncoupled from the train within the limits of a guaranteed sector set by the road supervisor.

The Organization of Train Traffic

The train traffic schedule is of primary significance to rail transport. It is emphasized in the Rules that the traffic schedule should insure the most efficient use of the traffic and carrying capacities of the sectors and the processing capability of stations, highly productive use of rolling stock and the possibility for performing routine maintenance operations on the tracks, on structures, on SIB devices and communications and electric power-supply equipment.

The responsibility for the timeliness and the validity of assigning and cancelling passenger, mail and baggage and combined trains traveling within the bounds of two or more lines has been increased. The assignment and cancellation of such trains is performed by the first deputy minister.

Switching procedures with interlocking switching routes as well as when there are no switching light signals is made more precise. It is specified in Item 15.15 that the engineer in a locomotive doing the switching is forbidden from putting the engine into motion without receiving instructions from the switching supervisor personally by radio, by two-way yard communications equipment or a signal given with hand signaling devices. In addition to the instructions for the signal of the switching supervisor, before moving onto a switch on interlocking switching routes, the engineer should assure himself of a proceed signal from the switching light signal; before moving onto non-interlocking switches, he should receive a signal or a communication (in person, by radio or by loudspeaker system) from the switch attendant concerning the readiness of the switches for switching operations. When there are no switching light signals, a communication about the readiness of switches for switching operations should be received by the engineer from the deputy station master (in person, by radio or by two-way yard communication equipment), or it should be transmitted via the switching supervisor before moving onto interlocking switches.

Norms for the weight and length of freight trains traveling in the various directions and over each sector are specified in the traffic schedule and the plan for train classification, and they should correspond to the type of locomotive, the track profile on the sectors in which the trains operate, and the working length of the receiving and departure tracks at the stations in these sectors. To strengthen control over safe movement of passenger trains, the procedure for connecting more cars to a train than is the norm and for the passage of extra-long passenger trains is specified by the MPS.

The list of cars which may not be placed in trains has been expanded to ensure traffic safety. These include empty covered cars with open hatches, tank cars, hopper cars, grain cars, cement cars, etc , and rolling stock with upper and lower loading and unloading equipment with open doors.

To improve the service of line subdivisions and their workers and to reduce sector work loads from special trains for delivering food stuffs, the possibility of attaching no more than one passenger of closed freight car to electric trains over individual sectors, is allowed with the permission of the MPS (Item 15.28).

Improving the procedure for locomotive operation is very important. It is specified in Item 15.46 that locomotives engaged in train work should be operated within the limits of operating sectors. In exceptional cases, permission for locomotives to pass into sections where they do not normally work is granted by the MPS. This should promote an improvement in the technical state of the engine yard.

For more efficient use of receiving and departure tracks at individual stations, when track length is adequate for two powered trains to stop on it, it is permissible to break the track by signal light into two sections onto which these trains may be received. When a section of track beyond the signal light dividing the receiving track is occupied by a powered train, the second powered train can be received on the free section up to this signal light by a special signal at the entry (main route) signal light. What the entry (main route) light signal shows should depend on the reading of the main line light signal dividing the receiving track.

Requirements for entry and exit signals have been changed, taking into consideration the fact that semiphors have been excluded as a means of signaling. The entry signals should be shown by the deputy station master or, on his orders, by the interlock post operator. On sections equipped with dispatcher interlocking, the entry signal is shown by the train dispatcher.

The entry signal should turn off automatically after the first wheel pair of an oncoming train passes over it. At stations without electric rail circuits this should be done by the deputy station master or the interlock post operator after all of the oncoming train has passed it (Item 16.7).

The procedure for the simultaneous reception, at a station, of trains from opposite directions has been made more specific. The requirement for the unconditional prohobition of simultaneous receiving trains from opposite directions on two-track sections, if the continuation of the route of one of them crosses the route for receiving a passenger train, has been excluded. Such a prohibition has been left only for instances when trains approach a station with a grade steeper than six-thousandths. This supplement will improve the use of the traffic capacity of sections and stations without harm to traffic safety.

Clarifications to the procedure permitting occupation of the open line are extremely significant. It is stated in Item 16.16: "Departure of a train onto the open line without permission of the deputy station master is forbidden. A go-ahead indication from the exit signal serves as permission for occupying the open line for the engineer of the departing train; when the signal is malfunctioning, or when a train is departing from a track where there are no exit signals, a written permission of established form, or the order of the deputy station master, transmitted by radio or signla rod, is required."

To improve traffic capacity and save power resources, proceeding through a light signal showing "stop" when there is a caution signal--a reflecting sign in the shape of the letter "T"--is allowed for all freight trains without stopping. When there is a "go" signal on a locomotive light signal, a straightaway signal with an extinguished light permits the train to proceed without stopping, being guided by the display from the locomotive light signal (Item 16.27).

The requirement concerning the prohibition of a passenger train's departure onto the open line when all means of communication have been disrupted is excluded. The procedure for organizing train traffic in this case is specified by the "Handbook on Train Traffic and Switching Operations."

An increase in speed of up to 40 km/hour has been provided for maintenance trains traveling with the cars in front of the engine when there is radio communication on the engine and on a track machine, as a function of the track machine's design, in order to use the traffic capacity of the open line sections better, particularly at times when "windows" have been assigned for construction and repair work.

The requirements for an engineer after coupling a locomotive to a train are set forth in Item 16.37.

The terms block-section, track post, personnel train and passenger train have been made more precise in the new Rules. The following terms have been additionally included: catenary system, window, extra-long train, train signals and united trains.

In the next issue of the journal, consultation will be given on the new "Signaling Instructions" and the "Handbook on Train Traffic and Switching Operations."

An order has been issued by the Ministry of Railroads on the process of studying and testing knowledge of the Rules, the Signaling Instructions and Train Movement, the Rules and Handbooks for Safety and Production Sanitation Practices. The required knowledge of these documents for workers in all professions, the order for passing examinations and the frequency of testing have been specified by the order.

It is recommended that learning aids, posters, diagrams and training equipment be widely used when organizing the study of the Rules and the Handbooks.

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SPECIFIC PROBLEMS OF VARIOUS RAILROAD SYSTEMS CITED

Moscow GUDOK in Russian 29 Feb 80 p 2

[Article: "In People's Control Committees"]

[Text] Kaliningrad.--The enterprises of the oblast scientific-production association for agrochemical servicing of kolkhozes and sovkhozes are systematically delaying railroad cars during unloading above the established time allotted for this. The actual layover for the association is more than double the norm. For this reason during the past year the [use] of more than 1,000 railroad cars was lost, in which it would have been possible to haul in addition more than 50,000 tons of freight for the national economy.

Particularly unfavorable is the situation regarding the unloading of railroad cars on the Bagrationovsk and Gvardeysk Special Branches. The rayon people's control committees have imposed penalties on five officials for the shortcomings that have been allowed and have docked Comrade Rudokov, deputy chief of the Gvardeysk Special Branch, to recover the deficit.

Ulan-Ude.--The campaign against embezzlement, spoilage and loss of goods is being waged in an extremely poor manner on the Ulan-Ude Branch. More than half of the trains are not provided with guards. The entry access system has not had the hitches removed from it and adequate lighting, barriers and burglar alarms are lacking at stations, freight yards and container platforms. The separation of freight that is being transported from the shipping documents is systematically tolerated. Financial losses from embezzlement, shortfalls, losses, spoilage and damage amounted to 42,600 rubles in 1979.

The People's Control Committee of the Buryatskaya ASSR has issued a reprimand to Comrade Torchimayev, deputy chief of the Ulan-Ude Branch, and has docked him in the amount of a month's salary to recover the deficit.

Tashkent.--It has been determined by an audit that the number of damaged railroad cars is growing from year to year on the Central Asian RR. Damage amounting to 230,000 rubles has been incurred by the state during the past two years.

The executives of the railroad and of its branches are approaching the investigation of such cases as if it were a mere formality to be observed, they are not analyzing the causes for the damage thoroughly and are not taking effective measures to prevent and reduce it.

The People's Control Committee of the Uzbek SSR has issued a reprimand to Comrade Pershin, deputy chief of railroad car services, and to Comrade Mart'yanov, chief of the Khavast Branch.

Baku.--The People's Control Committee of the republic has examined the question of gross violations of state discipline during the acceptance for operation of a number of objects slated for production purposes on the Azerbaijan RR. Important railway projects which had been left unfinished by construction have been included here in the statistical reporting.

A commission under the chairmanship of Comrade Rzayev, former deputy chief of the railroad, and Comrade Rakhmanov, a member of the commission, signed a formal document on the acceptance for operation of equipping facilities for locomotives, although jobs worth more than 50,000 rubles remained unperformed. Comrade Eyvazov, who was chairman of the state commission and the deputy chief of services for water supply and sanitary engineering installation of the railroad, having gone the way of fraud, authorized a formal document for the acceptance for operation of a water conduit with a length of 12.7 km that contained major flaws in workmanship.

The People's Control Committee of the Azerbaijan SSR has issued a reprimand to Comrade Bagirov, first deputy chief of the railroad, and a severe reprimand to Comrade Rakhmanov, and has removed Comrade Eyvazov from the post that he had occupied. The question of the responsibility of Comrade Rzayev has been handed over to Party organs for scrutiny.

Chelyabinsk.--It has been determined by the verification of a letter from a group of employees of the Chelyabinsk Railroad Car Section that a sports hall was planned and built illegally by virtue of using funds for capital repairs upon a directive from the management of the branch. The costs incurred on the erection of the object amounted to 100,600 rubles. While drafting the plan for the sports hall, excesses were allowed in the set of facilities that were selected for auxiliary purposes and for which costly materials were used without justification for the finishing work.

The oblast people's control committee has issued a reprimand to Comrade Polovov, chief of the Chelyabinsk Branch, and to Comrade Kogan, chief of the financial division. Comrade Durnovtsev, chief engineer of the branch, has been docked for the unauthorized expenditure to recover the deficit.

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LENGTHY DELAYS IN UNLOADING CARS IN AZERBAIJAN

Baku BAKINSKIY RABOCHIY in Russian 21 Mar 80 p 2

[Article by the economic reviewer of BAKINSKIY RABOCHIY: "Warehouses on Wheels: Survey of the State of Affairs Regarding the Unloading of Railroad Cars"]

[Text] Recently a significant improvement has been achieved in the work of loading and unloading railroad cars on sidings at the republic's enterprises thanks to measures taken by Party organizations and by people's control organs. However, substantial defects that reduce the efficiency of utilization of the railroad's rolling stock have still not been totally eradicated. The BAKINSKIY RABOCHIY has already told about a number of specific instances of delays. Today the editors are publishing the first summary of above-norm layovers of railroad cars for January and February of the current year. The newspaper intends to publish similar summaries each month.

Ministries, Departments, Enterprises	Norm for Layover of Railroad Cars (in hours)	Actual Time of Layovers (in hours)
Azerbrybprom [Azerbaijan Fish Industry] Association	2.46	14.34
Administration of Nonferrous Metallurgy	4.43	5.26
Ministry of Rural Construction	4.92	15.2
Azneft' [Azerbaijan Petroleum Industry] Production Association	2.1	3.36
All-Union Kaspmorneftegazprom [Caspian Sea Petroleum and Gas Industry] Industrial Association	1.51	3.33

It must be said that this is far from a complete list of the ministries and departments and of the organizations and enterprises that are converting

railroad cars into warehouses on wheels. Only those which not only failed to reduce the layovers of rolling stock during loading operations in January and February, but actually increased the layovers in comparison with the corresponding period last year, have been included in the survey that is being published.

Thus, if enterprises of the Azerbrybprom Association held railroad cars too long, in fact by almost 8 hours above the norm on the average for two months of last year, then layovers in this organization exceeded the norm by 12 hours during the current year. The Machine Unit Production and Design Association increased layovers by 54 hours in comparison with last year. The layovers of railroad cars at enterprises of the Ministry of Rural Construction since the beginning of the year have exceeded the norm by more than 10 hours, which means that they were increased by 2 hours. For this ministry alone 270 railroad cars have been withdrawn from circulation for the two months.

If then one speaks of total layovers of railroad cars on the sidings of the republic's enterprises, then they have been reduced by one-half in comparison with last year. But this will in no measure whatsoever be able to set our minds at ease. One must keep in mind that though these losses be reduced, it might have been possible to haul more than 110,000 tons of freight in addition to what was carried.

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